

1.(Currently Amended) A method for producing a solid filament (1) from a liquid (2) in a vacuum chamber (70), ~~with the steps, comprising:~~

- ~~liquefaction of~~ liquefying a gas in a heat exchanger device (20) for producing the liquid (2), wherein the liquefying of the gas in the heat exchanger device comprises adjusting a p-T operating point of the liquid, and
- ~~supplying of~~ the liquid (2) via a supply line (27) and through a nozzle (30) into the vacuum chamber (70),

~~characterized in that~~ ———

~~the liquefaction of the gas in the heat exchanger device (20) comprises the adjusting of a p-T operating point of the liquid (2) at which the liquid (2) wherein the liquid~~ is converted into the solid aggregate state after exiting from the nozzle (30) into the vacuum chamber (70) and forms a collimated and stable jet.

2.(Currently Amended) The method according to ~~Claim~~ claim 1, ~~in which wherein~~ the adjustment of the p-T operating point of the liquid (2) comprises a tempering of the liquid in the heat exchanger device (20) to an operating point temperature T_0 below which the liquid becomes solid.

3.(Currently Amended) The method according to ~~Claim 1 or 2, in which~~ claim 1, wherein the adjustment of the p-T operating point of the liquid (2) comprises a tempering of the liquid in the heat exchanger device (20) to an operating point temperature T_0 that is less than 1 degree above the triple point T_T of the liquid (2).

- 4.(Currently Amended) The method according to ~~at least one of the preceding claims,~~
~~in which claim 1, wherein~~ the tempering of the liquid (2)-takes place while it flows
through the supply line-(27).
- 5.(Currently Amended) The method according to ~~Claim claim~~ 4, ~~in which wherein~~ the
tempering of the liquid (2)-takes place along the supply line (27)-up to the nozzle
(30).
- 6.(Currently Amended) The method according to ~~at least one of the preceding claims,~~
~~in which claim 1, wherein~~ a temperature gradient is formed along the supply line
(27)-in the heat exchanger device (20)-that is less than 2 degrees/cm.
- 7.(Currently Amended) The method according to ~~at least one of the preceding claims,~~
~~in which claim 1, wherein~~ the tempering takes place in the heat exchanger
device (20)-with a liquid cooling medium.
- 8.(Currently Amended) The method according to ~~Claim claim~~ 7, ~~in which wherein~~ the
temperature of the cooling medium is adjusted with a thermostat-(40).
- 9.(Currently Amended) The method according to ~~Claim 7 or 8, in which claim 7,~~
~~wherein~~ a temperature or a vapor pressure of the cooling medium is measured
in the heat exchanger device-(20).

- 10.(Currently Amended) The method according to ~~at least one of the preceding claims, in which claim 1, wherein~~ an optical measuring of the liquid (2)-exiting into the vacuum chamber (70)-takes place.
- 11.(Currently Amended) The method according to ~~Claim 9 or 10, in which claim 1, wherein~~ at least one of the ~~parameters~~ gas pressure, supply volume of the cooling medium and temperature of the cooling medium in the heat exchanger device (20)-is adjusted as a function of the result of ~~the~~ a temperature measurement, ~~the~~ a vapor pressure measurement or ~~the~~ an optical measurement.
- 12.(Currently Amended) The method according to ~~Claim-claim 11, in which-wherein~~ a control circuit is formed for adjusting the at least one parameter.
- 13.(Currently Amended) The method according to ~~at least one of the preceding claims, in which claim 1, wherein~~ the liquid (2)-in the nozzle (30)-is subjected to a jet formation.
- 14.(Currently Amended) The method according to ~~at least one of the preceding claims, in which claim 1, wherein~~ the supplied gas is a noble gas.
- 15.(Currently Amended) The method according to ~~Claim-claim 14, in which-wherein~~ the supplied gas is xenon.

- 16.(Currently Amended) The method according to ~~at least one of the preceding~~
~~claims, in which~~ claim 1, wherein the p-T operating point of the liquid (2) is
selected in such a manner that the liquid (2) becomes solid after exiting from the
nozzle (30) within a freezing length (a) that is less than 10 mm.
- 17.(Currently Amended) A nozzle arrangement (10) ~~especially for producing solid~~
filaments (1) in a vacuum, ~~that comprises~~ comprising:
- a heat exchanger device (20) for producing a liquid (2) from a gas, and
~~— a supply line (27) with a nozzle (30) through which the liquid (2) can exit into~~
~~the vacuum,~~
- ~~characterized in that~~
wherein the heat exchanger device (20) is adapted for adjusting a p-T operating
point of the liquid (2) such that the liquid (2) can be converted after exiting from
the nozzle (30) into ~~the~~ a vacuum into ~~the~~ a solid aggregate state and a colli-
mated and stable jet form, and
- a supply line with a nozzle through which the liquid can exit into the vacuum.
- 18.(Currently Amended) The nozzle arrangement according to ~~Claim~~ claim 17, in
~~which~~ wherein the heat exchanger device (20) extends along the supply line
(27).
- 19.(Currently Amended) The nozzle arrangement according to ~~Claim~~ claim 18, in
~~which~~ wherein the heat exchanger device (20) extends along the supply line (27)
up to the nozzle (30).

- 20.(Currently Amended) The nozzle arrangement according to ~~at least one of Claims 17 to 19, in which~~ claim 17, wherein the heat exchanger device (20) extends over a length of at least 40 cm along the supply line.
- 21.(Currently Amended) The nozzle arrangement according to ~~at least one of Claims 17 to 20, in which~~ claim 17, wherein the supply line (27) runs helically through the heat exchanger device (20).
- 22.(Currently Amended) The nozzle arrangement according to ~~at least one of Claims 17 to 21, in which~~ claims 17, wherein the supply line (27) has a wall thickness in a range of 0.1 mm to 0.5 mm.
- 23.(Currently Amended) The nozzle arrangement according to ~~at least one of Claims 17 to 22, in which~~ claim 17, wherein the heat exchanger device (20) is a counterflow cooler.
- 24.(Currently Amended) The nozzle arrangement according to ~~at least one of Claims 17 to 23, in which~~ claim 17, wherein the heat exchanger device (20) contains a liquid cooling medium.
- 25.(Currently Amended) The nozzle arrangement according to ~~at least one of Claims 17 to 24, in which~~ claim 17, wherein the heat exchanger device (20) comprises a tubular cooling jacket (21) ~~on whose end (22) and~~ the nozzle (30) is arranged at an end of the cooling jacket.

26.(Currently Amended) The nozzle arrangement according to ~~Claim~~claim 25, in ~~which~~wherein the nozzle (30) is demountably arranged on the cooling jacket (21).

27.(Currently Amended) The nozzle arrangement according to ~~Claim 25 or 26~~, in ~~which~~claim 25, wherein the nozzle (30) is adjustably arranged on the cooling jacket (21) in such a manner that the orientation of a dispensing direction of the nozzle (30) can be changed relative to a longitudinal extension of the cooling jacket (21).

28.(Currently Amended) The nozzle arrangement according to ~~at least one of Claims 17 to 27~~, in ~~which~~claim 17, wherein a screening device (35) is provided that serves for thermal insulation of the nozzle (30).

29.(Currently Amended) The nozzle arrangement according to ~~at least one of Claims 25 to 28~~, in ~~which~~claim 25, wherein a fastening device (50) is provided for fastening the cooling jacket (21) to a vacuum flange.

30.(Currently Amended) The nozzle arrangement according to ~~at least one of Claims 25 to 29~~, in ~~which~~claim 25, wherein the heat exchanger device (20) is connected to a thermostat (40) with which the cooling medium in the heat exchanger device (20) can be tempered.

- 31.(Currently Amended) The nozzle arrangement according to ~~Claim~~claim 30, in which wherein the thermostat (40) is arranged in such a manner that it is decoupled from oscillations relative to the heat exchanger device ~~(20)~~.
32. (Currently Amended) The nozzle arrangement according to ~~Claim 30 or 31~~, in which claim 30, wherein the heat exchanger device (20) is connected via thermally insulated lines ~~(24, 25)~~ to the thermostat.
- 33.(Currently Amended) The nozzle arrangement according to ~~at least one of Claims 17 to 32~~, in which claim 17, wherein a temperature sensor or vapor-pressure sensor is arranged in the heat exchanger device ~~(20)~~.
- 34.(Currently Amended) The nozzle arrangement according to ~~at least one of Claims 17 to 33~~, in which claim 17, wherein the supply line ~~(27)~~ opens at the nozzle (30) with a ~~given~~ convex inside contour ~~(32)~~ into an exit opening.
- 35.(Currently Amended) The nozzle arrangement according to ~~at least one of Claims 17 to 34~~, in which claim 17, wherein the nozzle ~~(30)~~ is detachably connected to the supply line ~~(27)~~, a seal being arranged between the nozzle ~~(30)~~ and the supply line ~~(27)~~ which seal consists of an alloy of copper and beryllium.
- 36.(Currently Amended) An apparatus with a vacuum chamber ~~(70)~~ and a nozzle arrangement (10) according to ~~at least one of the preceding claims~~ claim 17 for producing a solid filament from a liquid in the vacuum chamber ~~(70)~~.

37.(Currently Amended) ~~The use~~ A method of ~~a method or of using~~ a nozzle arrangement according to ~~at least one of the preceding claims~~ claim 17 for producing a frozen filament with a length of at least 10 cm and a diameter in a range of 10 µm to 100.